New Hampshire DOT

FOCUS ON RESEARCH

2004-2 A Publication of the NHDOT Research Office April 2004

83rd TRB Annual Meeting

Cruise the hallways of the Marriott Wardman Park, Omni Shoreham, or Hilton in Washington, DC one week in January and you're likely to bump into someone from the NHDOT. The 5-day, 3-hotel Transportation Research Board (TRB) Annual Meeting attracts nearly 10,000 transportation professionals from around the world. This year's 83rd annual meeting was attended by representatives from Traffic and Materials & Research as well as Commissioner Carol Murray. Past years' meetings have included representatives from Highway Maintenance, IT Services, and the Bureau of Environment.

The TRB Annual Meeting provides an unparalleled opportunity to share knowledge and perspectives with colleagues and to learn about the latest developments in transportation research, policy, and practice. This year's program covered all transportation modes, with more than 2,200 presentations in 500 sessions. In addition, three themes of special interest were spotlighted:

- Renewing the Transportation Infrastructure;
- Security: Measures that can Make a Real Difference; and
- Funding: Reauthorization and Beyond.

Specialty workshops, poster sessions, committee meetings, and showcase exhibits complement the formal sessions and provide a variety of opportunities for information sharing and interaction with other members of the transportation community. The "Feature Project" of this issue demonstrates an example of the benefits gained from NHDOT participation in this event. A discussion of the results of NCHRP Report 477, which presented methods for evaluating the types of reinforcement systems used in the Barron Mountain rock cut, provided the NHDOT Engineering Geology staff with valuable background information on nondestructive testing techniques. In addition, the session provided them with the opportunity to meet and discuss the Barron Mountain site with the report's co-author and other experts in the field. Eventually, because of his unique qualifications in this type of testing, the co-author of the report, Ken Fishman, was chosen as the Principal Investigator of the Barron Mountain research project.

For more information on TRB or other research programs, visit the NHDOT Research website at: http://nh.gov/dot/materialsandresearch/research/links.htm

Feature Project

"Condition Assessment and Evaluation of Rock Reinforcements Along Barron Mountain"

Rock cut #004 along Barron Mountain in Woodstock was created in 1972 for the construction of I-93. Following a major rockslide during construction, an extensive system of rock bolts and tendons was installed to stabilize the 130-foot tall cut. The generally accepted design life of such a system is 50 years. Given the age of this installation and because the actual life of rock reinforcement systems can be affected by unknown factors such as aggressive environmental conditions, NHDOT Engineering Geologist Dick Lane proposed a study to evaluate the condition of the reinforcement system and to formulate an action plan for future monitoring, maintenance, and/or remediation of system elements. This project was selected at the NHDOT Research Advisory Council (RAC) meeting in April 2003, and determined to be a high priority project. Because of their expertise in this type of work, McMahon and Mann Consulting Engineers, P.C. (MMCE) of Buffalo, NY was selected to perform this study.

The Barron Mountain rock stabilization system consists of approximately 70 rock tendons and more than 100 rock bolts. The rock bolts were installed to depths of 10 to 30 feet and tensioned to improve the overall integrity of the rock mass. The rock tendons, which are not tensioned, are 60 feet in length.

Work began in August 2003 with the collection of weathered rock and groundwater samples to evaluate the site's environmental conditions. These samples were analyzed to assess the corrosiveness of the anchor environment. MMCE inspected the bolts and performed non-destructive testing (NDT) on selected reinforcements. The Bureau of Bridge Maintenance provided access to the rock face through the use of their 60-ton crane with a 100 foot boom and personnel cage. The NDT procedures, consisting of half-cell potential, polarization, impact response and ultra sonic testing, were used to estimate the loss of cross sectional area of the anchors and bolts through corrosion. Based on the results of the NDT testing and environmental evaluation, Ken Fishman, Ph.D., P.E. of MMCE has recommended that invasive testing of the anchors be conducted. The invasive testing would entail actual removal of selected reinforcements and physical, chemical and metallurgical testing of the steel and grout samples retrieved from the removed anchors. This would provide confirmation of results obtained from the NDT testing and provide additional information for predicting when the anchors should be replaced.

This project was made possible through the collective efforts of the Bureau of Bridge Maintenance, Franklin yard and Highway Maintenance District 3, Sheds 304, 325 and 313.

To learn more about this research, contact the NHDOT Research Office at (603) 271-3151 or visit http://nh.gov/dot/materialsandresearch/research/